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09/909,998	07/23/2001	Sajeev John	13727	1419

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EXAMINER

CHOI, WILLIAM C

ART UNIT PAPER NUMBER

2873

DATE MAILED: 05/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/909,998

Applicant(s)

JOHN ET AL.

Examiner

William C. Choi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 March 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-69 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 38-61 is/are allowed.
- 6) ☒ Claim(s) 1-10 and 62 is/are rejected.
- 7) ☒ Claim(s) 11-37 and 63-69 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.


Loha Ben
Primary Examiner

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

Claim 1 is objected to because of the following informalities: specifically, in line 8, applicant discloses, "at least of said", when it should read, "at least one of said".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4, 5, 7, 8 and 62 are rejected under 35 U.S.C. 102(e) as being anticipated by Joannopoulos et al (U.S. 6,058,127).

In regards to claims 1 and 62, Joannopoulos et al discloses a photonic crystal having a tunable photonic band structure (abstract and column 1, lines 18-26 and column 3, lines 38-47, Figure 1), comprising; a periodic composite dielectric material having at least two dielectric constituents including a first dielectric constituent having a first refractive index (column 3, lines 1-3, Figure 1, "102") and a second dielectric constituent having a second refractive index smaller than the first refractive index

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(column 3, lines 4-6, Figure 1, "104") so that the periodic composite dielectric material has a photonic band structure; and at least one of said at least two dielectric constituents having refractive index properties which can be locally or globally changed throughout said photonic crystal in a controlled manner (column 3, lines 27-35) whereby changing the refractive index properties modulates said photonic band structure locally or globally throughout said photonic crystal for providing control of propagation of light through said photonic crystal (column 1, lines 44-49).

Regarding claim 2, Joannopoulos et al discloses wherein said periodic composite dielectric material includes periodic void regions throughout a volume of said periodic composite dielectric material (column 3, lines 9-17, Figure 1, "106").

Regarding claims 4 and 5, the periodic composite dielectric material of Joannopoulos et al would inherently include a complete photonic bandgap which is tunable, this being reasonably assumed from the disclosure of the first and second dielectric materials (column 3, lines 6-8).

Regarding claims 7 and 8, Joannopoulos et al discloses wherein the first dielectric constituent is a semiconductor (column 3, lines 6-7, re "silicon").

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 6, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopoulos et al as applied to claim 2 above, and further in view of Zakhidov et al (U.S. 6,261,469 B1).

Regarding claim 3, Joannopoulos et al discloses as set forth above but does not specifically disclose wherein said periodic composite dielectric material is an inverted opal wherein said void regions are overlapping air spheres formed in a face centered cubic lattice. Within the field of endeavor, Zakhidov et al teaches a photonic crystal (column 16, lines 53-63) formed in a face centered cubic lattice (column 7, lines 2-5, Figure 3) wherein said periodic composite dielectric material is an inverted opal (column 7, lines 9-13 and column 20, lines 9-10, Figure 3) wherein said void regions are overlapping air spheres (column 20, lines 9-12) for the purpose of maximizing diffraction efficiency (column 20, lines 13-15).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for said composite dielectric material of Burt et al to comprise the limitations set forth above for the purpose of maximizing diffraction efficiency.

Regarding claim 6, the periodic composite dielectric material of Joannopoulos et al would inherently include a complete photonic bandgap which is tunable, this being reasonably assumed from the disclosure of the first and second dielectric materials (column 3, lines 6-8).

Regarding claims 9 and 10, Joannopoulos et al discloses wherein the first dielectric constituent is a semiconductor (column 3, lines 6-7, re "silicon").

Allowable Subject Matter

Claims 38-61 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented in claim 38: a photonic crystal as claimed, specifically wherein at least one of a first and second dielectric constituents is optically anisotropic and has refractive index properties which can be locally or globally modified in a controlled manner whereby changing the refractive index properties changes said photonic band structure for providing control of propagation of light through said photonic crystal.

Claims 11-37 and 63-69 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented in claim 11: a photonic crystal as claimed specifically wherein at least one of at least two dielectric constituents, infiltrated into void regions, is optically anisotropic and wherein said optical anisotropy is controlled by application of one of an electric, magnetic and electromagnetic field.

The prior art fails to teach a combination of all the claimed features as presented in claims 12, 15, 20, 24 and 28: a photonic crystal as claimed specifically wherein at least one of at least two dielectric constituents, into void regions, is optically anisotropic and wherein said optical anisotropy is controlled by application of one of an electric, magnetic and electromagnetic field.

The prior art fails to teach a combination of all the claimed features as presented in claims 13, 16, 19, 23, 27 and 34: a photonic crystal as claimed specifically wherein at least one of at least two dielectric constituents, into void regions, is optically anisotropic and wherein said optical anisotropy is controlled by application of one of an electric, magnetic and electromagnetic field.

The prior art fails to teach a combination of all the claimed features as presented in claims 14, 17, 18, 21, 22, 25, 26, 29-33 and 35-37: a photonic crystal as claimed specifically wherein at least one of at least two dielectric constituents, infiltrated into void regions, is optically anisotropic and wherein said optical anisotropy is controlled by application of one of an electric, magnetic and electromagnetic field.

The prior art fails to teach a combination of all the claimed features as presented in claims 63 and 66-68: a method of tuning a photonic band structure in a photonic crystal as claimed, specifically wherein said second dielectric constituent includes at least one optically anisotropic material infiltrated into said void regions, whose refractive index properties can be changed in a controlled manner.

The prior art fails to teach a combination of all the claimed features as presented in claims 64-65: a method of tuning a photonic band structure in a photonic crystal as

claimed, specifically wherein a first dielectric constituent is optically anisotropic whose refractive index properties can be changed.

The prior art fails to teach a combination of all the claimed features as presented in claim 69: a method of tuning a photonic band structure in a photonic crystal as claimed, specifically wherein a first dielectric constituent is optically anisotropic whose refractive index properties can be changed.

Response to Arguments

Applicant's arguments with respect to claims 1-69 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Choi whose telephone number is (703) 305-3100. The examiner can normally be reached on Monday-Friday from about 9:00 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

W.C.

William Choi
Patent Examiner
Art Unit 2873
May 20, 2003



Loha Ben
Primary Examiner